in French millimetres, and not in parts of German inches, which require reduction.

As the asci vary much in length, only the thickness is given, though, under certain circumstances, as in Sphæriæ, it is often quite as variable as the length. In one or two instances we should have been glad to see more critical remarks, as, for example, under *Peziza venosa*, where the larger figure so exactly accords with that of Fries in the "Atliga och giftiga Svampar" of *Discina perlata*, that we should have been glad to have heard whether there is any real distinction between the two. As we used to find it every spring in our younger days, it was more like the figure of Greville's *Peziza reticulata*, than that before us. Something again might have been said respecting the resemblance of our author's very curious *Peziza corium*, to the North American *Peziza craterium*, with which it has evidently a close affinity. There is, we think, no doubt that the *Verpa digitaliformis* of England is the same with that figured by Herr Weberbauer. We shall be truly glad to find that this beautiful work meets with such success as to ensure its continuance.

It is quite curious to observe how an interest in fungi has rapidly increased in this country. The late Fungus Show at South Kensington was so well attended that the Council offer for next year a very ample list of figures, and as especial prizes are to be given for collections of novelties, or for cultivated species, the meeting will be one of much importance. Even in Scotland, where a short time since fungi were looked on as "abominations," there is a very active movement in their favour, especially amongst the clergy, who have made some very interesting additions to our Mycology, and a fungus-show is projected next autumn at Aberdeen. In England, where some of the older students are passing away, it is a great pleasure to know that the subject is taken up by such strictly scientific observers as Mr. Plowwright, Mr. Renny, and Mr. Phillips, not to mention many other names of great promise.

M. J. BERKELEY

OUR BOOK SHELF

Beeton's Science, Art, and Literature. A Dictionary of Universal Information; comprising a complete Summary of the Moral, Mathematical, Physical, and Natural Sciences; a Plain Description of the Arts; an Interesting Synopsis of Literary Knowledge; with the Pronunciation and Etymology of every leading term. Containing nineteen hundred and eighty Columns, and upwards of six hundred Engravings. 2 vols. (London: Ward, Lock, and Tyler. No date.)

THIS book does not pretend to be, and very evidently is not, more than a compilation from other cyclopædias, and from works on the various subjects of which it treats. So far as we have examined it, most of the information contained in it is derived from the former source, and it is impossible that any thoroughly trustworthy reference-book can be compiled in this manner, especially if the compiler or compilers have no special knowledge of the subjects with which they deal. The work pretends to give only a summary of facts, but in many of the articles much space is wasted by comment and reflection. There is absolutely no article on the Spectroscope, which is referred to *Spectrum*, an article without any illustrative cut, occupying one-third of a column, that might have been written twenty years ago. Why is there no article *Evolution?* and why, under *Development*, is the greater part of the short article occupied with the "Vestiges of Creation," and no reference whatever made to the state of the doctrine in Germany and America? Under the very specific heading *Crannoges* the general subject of Lake-dwellings is discussed, the writer evidently not being aware of the important distinction between the Crannoges of Ireland and the Lake-dwellings of Switzerland. A very poorly-executed copy of Keller's restoration of a Swiss lake-dwelling is the illustration to the article *Crannoges*. We say again no work of this kind can be regarded as a standard reference-book unless the editor has at his command a band of master specialists. The illustrations, as a rule, are inferior, and many of them seem well worn; many, moreover, are totally useless, such as those put beside the article *Drawing* and similar articles, which seem to be inserted simply to make the book take with a certain class. We think there is still room for a comprehensive reference dictionary containing information on all subjects compactly put together, No one at the present day, when there are such multitudes of special treatises in every department of human knowledge, would ever think of resorting to an encyclopædia to *study* a subject; and thousands, we believe, would be thankful for an all-comprehensive reference-book which should present in the briefest possible space the leading and latest facts under each heading free of all comment and speculation. Such a work might be as comprehensive as the "English Cyclopædia," or the "Encyclopædia Britannica," perhaps more so, and yet not exceed in bulk of matter the work at the head of this notice. All the scientific articles in such a work, however, and many others besides, could only be written satisfactorily on such a plan by men of special knowledge in each department; such men alone can judge what is of primary and what is of secondary importance.

Scientific Handicraft; A Descriptive, Illustrated, and Priced Catalogue of Apparatus. Vol. I. Mechanics, Hydrostatics, Hydrodynamics, and Pneumatics. By J. J. Griffin. F.C.S. Pp. 186. (London, 1873).

THIS is a useful Catalogue of Apparatus, which contains an account of the method of using the principal pieces of apparatus which are described. There are also suggestions for keeping instruments in good order. It will be found useful by those who select apparatus for purposes of school teaching or public lecturing; and Mr. Griffin has done good service by endeavouring to introduce as many new forms of apparatus, or modifications of old forms, from Germany and France, as he could obtain knowledge of.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

The Shrinking of the Earth and Terrestrial Magnetism

SINCE writing my previous letter (vol. ix. p. 141) I have received a note from Mr. Darwin, who says that in his work on "Coral Reefs," he arrived at the conclusion that volcanoes are not found in areas of subsidence. As I have succeeded, I think, in eliminating them from areas of upheaval, it may be that they occupy the boundary line of the oscillating land, and are stationed on or near the fissures and joints along which the earth's crust has given way. At all events, I invite a careful examination of those areas which we know to be rising, such as the northern circumpolar region, Australia, &c., in the firm conviction that volcanoes will not be found on any of them.

On another point I am very glad to say Mr. Darwin agrees with me, and I am therefore supported by his great authority. He tells me that in his work on "Volcanic Islands" he arrived at the conclusion that the great continents are rising, and the ocean beds sinking. This, of course, is only an hypothesis, and will remain so until the world has been carefully surveyed, but the large number of facts I have collected, and which will,

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I hope, be shortly published, go a long way towards proving it. Accepting this hypothesis, the next question we have to decide is whether the rising of the land is an absolute or a relative rising; whether, in fact, the earth's periphery as a whole is undergoing enlargement or contraction, is stretching or shrinking. To decide this by direct observation is not easy; for water being our only measure, the same effect will be produced either by the sinking of the one portion or the rising of the other, that is, of course, if the rising or sinking be general; while if it be a local rising at one place, it may (as is familiarly known, and as I shall point out presently) be due to the lateral pressure caused by an adjacent subsiding area. In the absence of direct experiment, we may be guided by analogies from other facts. These facts are of two kinds—astronomical and geological.

Since the days of Laplace, the nebular hypothesis has been generally received by astronomers, as the one which best meets observed facts. This hypothesis predicates the existence of gravitation everywhere, and shows how, by its influence, the various heavenly bodies have become condensed from nebular matter. It predicates that this force is still active everywhere, and that everywhere within our observation we have a condensation of matter in progress, matter condensing from a highly diffused condition to one of greater density. Thus each member of our own system, it is argued, is gradually and surely nearing the sun, and at the same time is shrinking, and the various planets are, in fact, in so many stages of evolution, and exhibit for us the various phases which the earth has passed through and will pass through before it is landed in the sun. This is all very elementary. I quote it only to show that the evidence of astronomy is that the earth is contracting, that its periphery is diminishing in area, and that therefore it is probable that the subsidence of the ocean-bed is absolute, while the upheaval of the land is relative only.

Geologists argue differently and yet come to the same conclusion. They argue that the original condition of the earth was an incandescent one, and that it has assumed its present form after a gradual cooling, that is a gradual contraction. In Mr. Geikie's words, recently reported in your pages, "Among the geologists of the present day there is a growing conviction that upheaval and subsidence are—concomitant phenomena, and that viewed broadly, they both arise from the effects of the secular cooling and consequent contraction of the mass of the earth." The evidence of geology, then, is at one with that of astronomy in making the shrinking of the earth absolute and not relative merely.

Now it is very clear that if the shrinking earth acquired a certain amount of rigidity, such shrinking would cease to take place uniformly, and the crust would give way along certain weak lines, and that corrugations, *i.e.* mountain-chains, and deep pits, or ocean hollows, would be formed; and not only so, but the sinking of a given area would give rise naturally to a certain thrust upwards of a contiguous area. To quote the graphic words of Mr. Geikie: "Some portions have sunk more than others. These having to accommodate themselves into smaller dimensions would undergo vast compression and exert an enormous pressure on the more stable tracts which bounded them. It could not but happen that after long intervals of strain, some portions of the squeezed crust would at length find relief from this pressure by rising to a greater or less height according to their extent and the amount of force from which they sought to escape." From this we may conclude (what I have not seen mentioned elsewhere), that from the contraction of the earth alone we may deduce the result that the land areas have been gradually growing larger and the ocean areas smaller; that originally when the crust was less rigid, its surface was almost uniformly level and covered with water, and that as it gradually became corrugated, the land first appeared as an archipelago of islands which were gradually joined together into continents in the way Australia was clearly constructed, comparatively recently; or in other words, that the proportion of subaërial to sub-aquæous deposits must diminish as we recede in geologic time, inasmuch as the area of sea, *i.e.* of water-covered surface, increases.

In this statement of the gradual shrinking of the earth there is little that is new, and if it accounted for all the facts I should not have troubled you with another letter. It has been taken for granted hitherto, if I be not mistaken, that areas of subsidence and upheaval are scattered about the world in a sporadic manner, with as little order and aim as plums in a pudding; that the earth being in process of shrinking, areas of subsidence occur at any point where the earth's crust is weak; but the evidence which I have collected and which I hope the Geographical Society will publish, goes far to show that these areas are not sporadic but continuous, and further, that the foci of upheaval are in the circumpolar regions. That it is there where we meet with proofs of current and rapid upheaval almost at every step, and the farther we go north or south from the equator the more rapid does the rise seem to be, while in the equatorial regions the land masses are to a great extent quiescent; we cannot resist the conclusion that the earth is stretching itself in the direction of its shortest axis, that its periphery is being thrust out in the direction of the Poles. Now as we have shown that the earth is absolutely shrinking and that when any local uprising occurs it is due to the lateral pressure caused by a subsiding area, it becomes interesting to inquire what kind of strain upon the earth would produce a squeezing of it out in the direction of the Poles. I can see only one explanation, namely, that the strain is being applied in the way of a stricture about the world's equatorial region, that it is girdled in that region by some force which is tightening upon it, and this tightening produces a partially compensating protrusion of the two polar regions. I conceive that in a spheroid constructed of partially elastic materials, the effect of such a stricture will cause, besides a sensible diminution of the whole periphery of the sphere, a lateral thrust at right angles to the pressure applied, and thus only can I account for it. This would, if I am not mistaken, have another effect, and this a very important one; it would induce magnetism in the earth, and that magnetism would have its poles in the regions of upheaval, and this is in fact so. The magnetic poles are strictly, so far as our evidence goes, in the very foci of upheaval of the circumpolar regions. This correlation of terrestrial magnetism with the force that is causing a tension about the earth's equator, if sustained would surely go far to explain that crux of physical science referred to by Sir William Thomson in his address to the British Association at Edinburgh, namely, the cause of the earth's magnetism; but my letter has already outgrown reasonable limits, and I must ask you to allow me to continue the subject in another.

HENRY H. HOWORTH

Derby House, Eccles, Jan. 2

Vivisection

IT has been suggested that the study of Huxley's "Elementary Physiology" is likely to make children indulge in cruelty. Allow me to give the experience of the father of five boys on the subject.

Those old enough to be taught from that book are so; and have attended the professor's lectures and seen some of his experiments. The impression left on their minds, from the reverent and touching treatment of the subject by the able professor, has led to an improved and exalted respect for the rights and life of the meanest thing that crawls.

Although these boys are now at what may be called the "predatory age," the interest and respect they evince for animal life is mainly to be attributed to the beautiful and refining lectures of the worthy and humane Huxley.

G. W. COOKE

London, E.C., Jan. 5

Moraines

MR. FRY, writing in NATURE (vol. ix. p. 103), says that "a glacier which has retreated from its terminal moraine is always the source of a stream of water, and this stream always cuts through the terminal moraine." He infers from this that a lake cannot be formed by a moraine damming up a valley.

I can assure him that this is a fact which at least admits of exceptions. The valley of the Kander in the Bernese Alps is, in its upper part at least, full of the moraines of extinct glaciers, now mostly overgrown with pine forest. One of these dams up a side valley and forms the beautiful Oeschinen Lake. The lake is fed from the glaciers of the Blumlis Alp, and its water is consequently muddy. Except in most unusual floods, it has no outlet above ground, but the side of the dam farthest from the lake is one mass of springs of water as clear as the celebrated streams of Lauterbrunnen, which are evidently fed by the water of the lake filtering through the dam. The dam, being a moraine, is of porous material.

JOSEPH JOHN MURPHY

Old Forge, Dunmurry, Dec. 24, 1873

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